Everett Lake

Allen County

Fish Management Report– 2005

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EXECUTIVE SUMMARY

Everett Lake is a 43-acre natural lake located 4 miles north of Arcola in western Allen County. It lies within the Eel River watershed and drains 685 acres. Water level is controlled by a concrete structure installed in 2002 to replace a metal culvert. During the past 20 years, water quality has declined.

Fishing quality has also deteriorated at Everett Lake. Although bluegills up to 9 inches long were present in 1999, gizzard shad were collected for the first time. By 2004, gizzard shad became the most abundant fish by number (43%) and weight (54%). White suckers and spotted suckers also increased. Large bass remained scarce. As a result, a project to eradicate the existing fish community and restock the lake with desirable sport fish is now under consideration.

Meanwhile, a study is also underway at several Indiana lakes to examine gizzard shad population dynamics and evaluate possible options to control shad abundance. As part of that project, additional sampling was conducted at Everett Lake in 2005.

During a June survey, 469 fish representing 12 species and weighing 439 pounds were caught. Gizzard shad dominated the catch by number (60%) and weight (58%). Fifty-three bluegills from 2-9 inches long were caught. Forty-nine largemouth bass were collected in the June survey and were 6½-15½ inches long. All but two were 8-inch or larger, but only five bass were legal-size (≥14 in).

During mark-recapture sampling in spring 2005, the average nightly catch rate of 8-inch and larger bass was 62/15-minutes and double the normal rate at most natural lakes. The estimated density of 8-inch and larger bass was 27 bass per acre (1,181 total).

Coontail was the dominant submersed aquatic plant encountered on two sampling occasions in 2005. Twenty-three beds of floating emergent plants were located and measured.

Current figures on shad abundance at Everett Lake are the highest levels recorded for shad populations in northern Indiana natural lakes. In lakes where shad are present, they typically comprise only 18% of the fish catch and 18% of the total weight.

It is unknown whether largemouth bass alone can control shad and sucker recruitment in the future at Everett Lake, especially if they continue to gain access to the lake from downstream areas in the watershed. If not, it is likely that fishing will not improve and that some corrective management action will be needed.

Sampling under the statewide gizzard shad workplan (204034) should again be conducted at Everett Lake in 2006. In the meantime, the feasibility of installing a fish barrier should also be examined and public support of each management option should be determined.

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Everett Lake is a 43-acre natural lake located 4 miles north of Arcola in western Allen County. It lies within the Eel River watershed and drains 685 acres. The surrounding area is mostly farmed. A drain tile enters the southwest corner of the lake and the outlet, Johnson Ditch, leaves the east end. Hydraulic retention time is about 405 days. Much of the shoreline is residential, although alterations have been minimal. A public boat ramp is present on the north side at a site leased since 1993 by the Department of Natural Resources.

Maximum depth of Everett Lake is 44 feet and average depth is 18 feet. The bottom is sand and muck. Water level is controlled by a concrete structure installed in 2002 to replace a metal culvert. During the past 20 years, water quality has declined (Table 1). Clarity declined from 9 feet in 1985 to an average of 3 feet in 2004 and 2005. Enough oxygen for fish is present now only in the top 5 feet during summer. Fertility also increased from moderate (46-54 TSI) to high levels (61-64 TSI). Coontail is the dominant submersed aquatic plant. Eurasian water milfoil and sago pondweed are common. Spatterdock is the major emergent plant and rings much of the shoreline.

There is little history of past fish management at Everett Lake. An initial survey was conducted in 1985. At the time, the lake had plenty of fast-growing bluegills and largemouth bass, although few big bass were present. In March 1995, a bluegill die-off occurred and large numbers were infected with water mold. Due to concerns over fish health, a survey was conducted in 1995 and additional sampling was done in 1999. Although bluegills up to 9 inches long were present in 1999, five gizzard shad, 13½-16½ inches long, were also collected for the first time. By 2004, gizzard shad became the most abundant fish in the lake by number (43%) and weight (54%). White suckers and spotted suckers also increased. Large bass remained scarce, despite imposition of a 14-inch minimum size limit at all lakes throughout the area in 1998.

Because fishing quality has deteriorated at Everett Lake, a project to eradicate the existing fish community and restock the lake with desirable sport fish is now under consideration. Meanwhile, a study is also underway at several Indiana lakes to examine gizzard shad population dynamics and evaluate possible options to control shad abundance. As a result, additional sampling was conducted at Everett Lake in 2005. The results, along with comparisons to previous surveys, are presented in this report.

METHODS

To monitor changes in the gizzard shad population and their effects on the fish community at Everett Lake, a follow-up survey was conducted on June 20-21, 2005. Sampling effort during the June survey included ½ hour of pulsed DC electrofishing with two dip-netters, as well as two experimental gill-net lifts and two trap-net lifts fished according to standard sampling guidelines. All captured fish were measured to the nearest tenth-inch. Weights were estimated from standard length-weight formulas generated from data on file from natural lakes fish population surveys in the area. Except for largemouth bass, fish scales were taken from dominant sport fish for age and growth analyses.

Largemouth bass density, size and growth were determined from mark-recapture electrofishing over a four-week period extending from April 26 through May 15. Scale samples for growth analyses were obtained from bass collected at this time. Effort consisted of one shoreline lap per night. Stunned bass were retrieved by two dip-netters, measured, and marked with a right ventral fin-clip before release. A Schnabel population estimate of 8-inch and larger bass was generated from the four nightly mark-recapture sessions and spaced at weekly intervals. Mean nightly estimates of catch per effort for four size categories of bass (8-11½ in, 12-13½ in, 14-17½ in, ≥18 in) were calculated. Numbers of bass in each size category were then determined by multiplying the mean nightly proportions of each group times the overall population estimate.

And lastly, submersed aquatic plants were sampled at 63 random sites on June 1 and July 25, based on standard Division of Fish and Wildlife sampling guidelines. A double-headed rake dropped off the bow of a boat was retrieved at a steady rate over a standard distance based on depth for each sample. The overall amount of plants on the rake (including algae), as well as the amount of each submersed species after sorting, were scored based on marks (0 through 5) spaced equally along the tines of the rake. The GPS coordinates of each site were also logged. Standard summary statistics were then generated to describe the submersed plant community. In addition, floating-leaf plant beds were mapped on July 28. GPS positions of the lakeward edge of each bed were tracked and bed widths were measured at various intervals using a laser rangefinder to calculate their coverage area. Species encountered at the edge of each bed and noted along a visual transect at each site through the bed were also recorded.

RESULTS

During the June survey, 469 fish representing 12 species and weighing 439 pounds were caught. Gizzard shad dominated the catch by number (60%) and weight (58%). Bluegills ranked second by number (11%) but sixth by weight (2%). Largemouth bass ranked third by number (10%) and weight (10%). Altogether, sport fish comprised only 25% of the numerical catch and only 14% of the total weight. Non-sport fish comprised 75% of the catch and 86% of the weight.

Fifty-three bluegills from 2-9 inches long were caught. Of all 3-inch and larger bluegills, 63% were 6-inch or larger, 50% were 7-inch or larger, and 18% were 8-inch or larger. The number of bluegills captured by electrofishing (13/15-min) was very low compared to other lakes in the area (average 100/15-min). Their growth rate was normal with age-4 fish averaging 6½ inches long.

Forty-nine largemouth bass were collected in the June survey and were 6½-15½ inches long. All but two were 8-inch or larger, but only five bass were legal-size (≥14 in). The electrofishing catch rate (24/15-min) was average compared to other Indiana natural lakes. Although few large bass were captured, growth rates of bass through age-4 (13 in) were above average and growth rates of older bass were normal.

Few other sport fish were collected. They included 12 yellow bullheads up to 12 inches long and an 11-inch brown bullhead. In addition, one 8-inch redear and an 8-inch warmouth were also collected.

Of 283 gizzard shad collected during the survey, all were 11-inch or larger. Some measured up to 17 inches long, but most (82%) were 12½-15 inches long. Most shad (83%) were caught by electrofishing at a rate of 118/15-minutes. In addition to shad, 37 white suckers measuring 11-18 inches long and 36 spotted suckers from 5½-14 inches long were collected. Other non-sport fish included four carp that were 25½-27½ inches long, a 16½-inch carpsucker, and a 14½-inch spotted gar.

During the mark-recapture sampling in spring, 770 largemouth bass (≥8-in), including 163 recaptures, were caught (Table 2). The average nightly catch rate was 62/15-minutes and double the normal catch rate at most natural lakes. The catch rate was also more than double the June catch rate (24/15-min) at Everett Lake. The estimated density of 8-inch and larger bass was 27 bass per acre (1,181 total). Despite the relatively

high number of bass in the lake, most bass caught during the spring sampling were small. Of the 1,181 bass estimated to be present, 47% (12.8/ac) were 8-11½ inches and 42% (11.5/ac) were 12-13½ inches long. Only 12% (3.2/ac) were 14-17½ inches and only a single 20½-inch bass (<0.1/ac) was 18-inch or larger. Of 74 individual bass captured between 14 and 17½ inches long, all but 18 (76%) were 15 inches or less.

Coontail was the dominant submersed aquatic plant encountered on both sampling occasions in 2005. It was collected at 37% of 60 littoral sites in June (littoral depth = 9 ft) and 27% of littoral sites in July (littoral depth = 7 ft). Where present, coontail rake scores averaged 1.36 in June and 1.53 in July. Its dominance index (i.e. percent of maximum potential amount) was only 10% in June and 8% in July. Eurasian water milfoil was collected at 15% (mean rake score = 1.44) of the sites in June and 16% in July (mean rake score = 1.44). Its dominance index was only 5% on both occasions. Also present in sparse amounts were long-leaf pondweed, sago pondweed, and curly-leaf pondweed. Overall plant abundance, species richness, and species diversity were low compared to other natural lake plant communities in the area. Filamentous algae was gathered on the rake at 12% of the sites in June and 29% in July.

Twenty-three beds of floating emergent plants were located and measured. They covered approximately 3.8 acres, or 9% of the surface area of the lake. The largest beds were present along the north shore and overall mean width was 30 feet. Their estimated lakeward perimeter extended 0.93 miles and covered 73% of the shoreline length. Spatterdock was present in 20 of the 23 beds and was observed along 33-100% (mean = 84%) of their transects. Water lilies were present in 13 beds and observed along 25-100% of their transects (mean = 76%). Other nearshore emergent plants noted along transects included arrowhead, bulrushes, cattails, pickerelweed, spatterdock, and swamp loosestrife. In addition, 27 isolated patches of spatterdock and water lilies were recorded.

DISCUSSION

Results of the June survey in 2005 were similar to results of the 2004 survey (Table 3). Gizzard shad continue to dominate Everett Lake both in number and pounds. Along with spotted and white suckers, shad now comprised the bulk of fish biomass in the lake. Prior to the 2004 survey, no shad or spotted suckers were collected and only one white sucker was captured in the 1985 survey. The percentage of non-sport fish increased from only 8% of the survey weight in 1985 and 23% in 1995 to 80% in 2004 and 86% in 2005. Meanwhile, the percentage of bluegills decreased from 60% of the number in 1985 to 24% in 1995, 32% in 2004 and to their lowest level of 11% in 2005. By weight, bluegills decreased from 36% in 1985 to only 2% in 2005. Bluegills typically average 44% of the number of fish collected in natural lake surveys and average 15% of the total pounds. Largemouth bass, although still abundant based on the mark-recapture sampling, varied from 19-64% of the survey catch by number prior to the appearance of shad and only 6-10% after shad were present. They were especially abundant in 1995. By weight, bass accounted for 31-60% of the total survey catch prior to shad but only 7-10% after shad. Bullheads, crappies, perch and miscellaneous sunfish have not been particularly abundant at Everett Lake. Carp, although never numerically abundant, have accounted for 6-23% of the survey weight.

While the number of bluegills at Everett Lake is now at its lowest level, catch rates and size structure have varied over the years (Table 4). The average size of bass has increased but fewer bass are now present. In 1985, the AC electrofishing catch rate of bluegills was 39/15-minutes. The average for area lakes at the time was 30/15-minutes. The DC catch rate in 1995 was low (19/15-min) but increased to 49/15-minutes in 2004 before declining again to only 13/15-minutes in 2005. As mentioned earlier, the typical DC electrofishing catch rate of bluegills in Indiana natural lakes is 100/15-minutes. In 1985, 7-inch and larger bluegills accounted for 15% of the total catch of 3-inch and larger bluegills. That figure increased to 50% in 1995 and 2005 and was 33% in 2004, although the fewest number of 7-inch and larger bluegills in any survey (20), excluding the 1999 trap catches, were caught in the latest one. From 1985 through 2004, bass in the 8- to 11½-inch size category comprised the largest percentages of 8-inch and larger bass, varying from 53% in 2004 to 91% and 92% in 1985 and 1995. In 2005, the percentage of

8- to 11½-inch bass decreased to 36% while the percentage of 12- to 13½-inch bass increased to 53%. Since 1985, the percentage of 14-inch and larger bass has never exceeded 11%. The length-frequency distribution of individual bass captured during the spring sampling (not counting recaptures) was bimodal with peaks at 10½ and 12½ inches, representing age-3 and age-4 fish (Figure 1). Based on the age composition of bass collected in the spring, Everett Lake contained 70 age-2 bass, 364 age-3 bass, 476 age-4 bass, 213 age-5 bass and 58 age-6 and older bass. Apparently the 2000 and 2001 year classes were stronger but bass recruitment has declined in recent years. Declining recruitment, along with abundant shad forage, could explain the fast growth among younger bass age groups.

Although fewer, but generally larger, gizzard shad were caught in the 2005 survey compared to 2004, they continue to comprise an excessive share of the fish community. By number, shad abundance increased from 43% in 2004 to 60% in 2005. By weight, shad increased from 54% to 58%. These figures are the highest levels recorded for shad populations in northern Indiana natural lakes (Table 5). In lakes where shad are present, they typically comprise only 18% of the fish catch and 18% of the total weight. Adult shad collected in 2004 ranged from 9-17½ inches and averaged 13 inches, while shad collected in 2005 ranged from 11-17 inches and averaged 13½ inches (Figure 2). Only three age-0 shad (1-1½ in) were collected in 2004 and none were collected in 2005. Therefore, most of the shad present in Everett Lake are too large to be eaten by bass, the lake's primary predator fish. However, the absence of shad less than 9 inches in 2004 and less than 11 inches in 2005 may indicate that bass are now controlling shad recruitment. Likewise, the size range of spotted suckers increased from 7-16½ inches in 2004 to 14-17 inches in 2005 and the size range of white suckers increased from 9½-17½ to 11-18 inches, indicating sucker recruitment may also be declining. Whether largemouth bass can control shad and sucker recruitment in the future, however, is uncertain, especially if they continue to gain access to the lake from downstream areas in the watershed. If not, it is likely that fishing will not improve and that some corrective management action will be needed.

RECOMMENDATIONS

Several options, alone or in combination, are available to improve fishing at Everett Lake: (1) implement no changes to determine whether bass can reduce shad and sucker abundance and monitor long-term natural variations in the lake community, (2) impose a larger size limit on bass to increase their ability to feed on larger shad and suckers, (3) stock additional predators at high densities, such as muskies, that are capable of feeding on large shad and suckers, (4) apply antimycin or rotenone at a low concentration to selectively kill shad, then possibly restock additional bass, and (5) use rotenone at a high concentration to kill all the fish in the lake, then restock a combination of desirable sport fish. Success of each option, other than the first, would increase if a barrier can be installed at the outlet to prevent re-entry of any unwanted fish.

A project is now underway to better understand gizzard shad population dynamics and test various shad control measures at several Indiana lakes (Workplan 204034). Everett Lake is now included in the project and is being monitored. In the meantime, the feasibility of installing a fish barrier should also be examined and public support of each management option should be determined.

Submitted by: Jed Pearson, fisheries biologist
December 1, 2005

Approved by: _____
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January 2, 2007

Table 1. *Historic oxygen levels (ppm) and water clarity (secchi depth) at Everett Lake from 1985 through 2005 (source - Division of Fish and Wildlife files).*

Depth (ft)	8/5/85	6/12/95	6/28/04	6/20/05
0	7.0	10.0	9.6	11.6
5	8.0	10.0	8.5	11.4
10	7.0	4.5	1.4	2.9
15	1.0	0.2	0.7	0.6
20	0.5	0.4	0.5	0.5
25	0.0	0.6	0.3	0.4
30	0.0	0.6	0.3	0.4
35	0.0	0.6	0.3	0.4
40	0.0	0.6	0.2	0.3
Secchi (feet)	9.0	5.0	2.5	3.5

Table 2. *Nightly catch (C), electrofishing catch rate per 15-minutes (CPE), number marked at large (M), number recaptured (R), Schnabel population estimate (N), and standard error (SE) of 8-inch and larger bass at Everett Lake in spring 2005.*

Date	C	CPE	M	R	N	SE
4/26/05	220	72.5	0	0	0	0
5/3/05	164	53.0	220	50	707	99
5/10/05	174	55.5	334	39	1,047	110
5/15/05	212	66.5	469	74	1,181	92

Table 3. *Number and weight of fish collected during fish population surveys at Everett Lake from 1985 through 2005. EF represents electrofishing hours, GN equals gill net lifts, and TN equals trap net lifts.*

	Number per year				Pounds per year			
Species	1985	1995	2004	2005	1985	1995	2004	2005
Black crappie	5	4	8	0	0.9	2.3	2.1	0
Bluegill	312	81	248	53	37.1	17.0	34.5	8.5
Brown bullhead	1	3	1	1	1.5	3.1	0.9	0.7
Channel catfish	1	0	0	0	1.7	0	0	0
Green sunfish	1	2	0	0	0.1	0.3	0	0
Hybrid sunfish	0	0	22	0	0	0	6.4	0
Largemouth bass	100	214	45	49	32.0	110.0	34.5	43.9
Pumpkinseed	10	1	1	0	1.2	0.2	0.2	0
Redear	21	4	23	1	4.6	1.1	5.8	0.4
Warmouth	41	19	0	1	4.5	2.6	0	0.4
Yellow bullhead	15	3	15	12	7.6	1.6	7.6	6.5
Yellow perch	6	1	2	0	2.7	0.8	1.6	0
Carp	1	4	3	4	6.0	42.0	31.8	34.2
Carpsucker	0	0	0	1	0	0	0	1.7
Gizzard shad	0	0	329	283	0	0	249.5	252.5
Lake chubsucker	2	0	0	0	0.8	0	0	0
Spotted gar	0	0	1	1	0	0	2.6	0.4
Spotted sucker	0	0	35	26	0	0	47.4	42.1
White sucker	1	0	39	37	1.8	0	39.0	47.9
TOTAL	517	336	772	469	102.3	180.9	463.8	439.0
Sampling Effort								
EF hours	1ac	¾dc	1dc	½dc				
GN lifts	6	4	2	2				
TN lifts	8	6	2	2				

Table 4. *Size distribution of bluegills and largemouth bass collected at Everett Lake from 1985 through 2005*.

Inches	8/5/85	6/12/95	6/16/99*	6/28/04	6/20/05
Bluegills					
<3	24	9	52	63	13
3-5½	170	24	85	51	15
6-6½	75	12	9	76	5
7-7½	36	20	9	54	13
≥8	7	16	10	5	7
Largemouth bass					
<8	23	18	na	2	2
8-11½	70	181	na	23	17
12-13½	5	11	na	16	25
14-17½	2	0	na	4	5
≥18	0	4	na	0	0

*effort consisted solely of 3 trap net lifts.

Table 5. *Number and weight of gizzard shad collected in standard fish population surveys at northern Indiana natural lakes*.

LAKE	Year	Number	%N	Pounds	%LB
Riddles	1987	397	51.4	140.24	50.6
Gilbert	1991	520	68.0	85.37	47.7
Gilbert	1991	520	68.0	85.37	47.7
Tamarack	1982	61	50.0	15.95	43.3
Ball	2001	764	77.0	109.68	43.1
Nyona	1987	555	42.0	244.1	37.2
Center	1984	223	27.9	133.78	37.1
Pleasant	1986	323	38.5	85.54	36.7
Ball	1988	263	53.3	78.27	34.4
Carr	1988	195	25.2	147.62	33.2
Koontz	2000	534	45.4	118.49	32.0
Lake-of-the-Woods	1987	619	58.5	82.27	32.0
Cedar	1994	436	52.5	79.17	31.3
Robinson	1993	400	29.5	161.81	30.9
Hamilton	1985	234	10.0	177.23	26.8
Center	2001	294	10.4	197.92	25.1
Bruce	1993	158	19.0	115.86	24.8
Bruce	2000	213	21.4	121.48	23.4
Barbee	1997	240	16.2	162.92	22.8
Diamond	1985	260	27.4	100.12	22.2
Robinson	1996	161	17.1	88.68	21.9
Manitou	1989	213	13.8	198.53	21.2
Dixon	1998	71	13.2	56.47	19.8
Wolf	1999	71	7.0	56.96	19.5
Silver	1989	302	26.3	74.84	19.2
Chapman (Little)	1999	71	3.1	79.7	18.5
Wolf	1987	183	9.3	125.48	18.3
Ball	1996	56	5.4	28.64	17.2
Webster	1998	174	9.8	60.89	16.4
Hoffman	1989	124	14.2	60.72	15.2
Webster	1995	119	8.6	49.94	14.6
McClure	1985	56	9.0	29.83	14.4
Crystal	1985	22	11.6	18.26	14.4
Cedar	2001	490	8.3	176.59	14.3
Rock	1997	63	9.3	53.69	14.3
Tippecanoe	1995	244	29.2	66.9	13.9
Beaver Dam	1994	703	30.5	24.77	12.9
Robinson	1999	140	7.5	59.22	11.8
Bass	1991	25	6.6	25.45	11.5
Nyona	1998	30	10.2	23.37	11.3
Chapman	1991	12	1.4	32.49	11.2

Ridinger	1995	71	9.1	52.48	11.0
South Mud	1996	45	13.1	22.15	10.9
Indian	1994	58	9.5	16.01	8.5
Barbee	1988	69	4.1	53.79	8.3
Pike	2000	171	17.5	57.1	8.2
Center	1997	76	3.7	58.24	8.0
Manitou	1998	21	4.4	14.3	7.9
Little Long	1992	20	1.5	41.58	6.5
Blue	1998	21	2.4	19.89	6.3
Fulk	1994	18	4.2	8.42	5.8
Caldwell	1979	12	0.8	13.7	5.0
South Mud	1980	13	2.4	13	4.6
Lake-of-the-Woods	1996	20	4.0	16.34	4.0
Maxinkuckee	1983	16	3.3	18.08	3.5
Yellow Creek	1986	167	14.7	14.1	3.5
Hill	1994	12	1.2	11.54	3.4
Winona	1994	74	5.6	12.01	3.3
Bass	1996	9	1.2	9.71	3.0
Carr	2000	76	6.4	9.24	1.8
Clear	1996	5	0.5	4.93	1.4
Bass	1991	1	0.3	1.06	1.1
Clear	1982	15	0.9	0.75	0.1

Figure 1. *Size distribution of individual largemouth bass captured during electrofishing at Everett Lake in April and May 2005.*

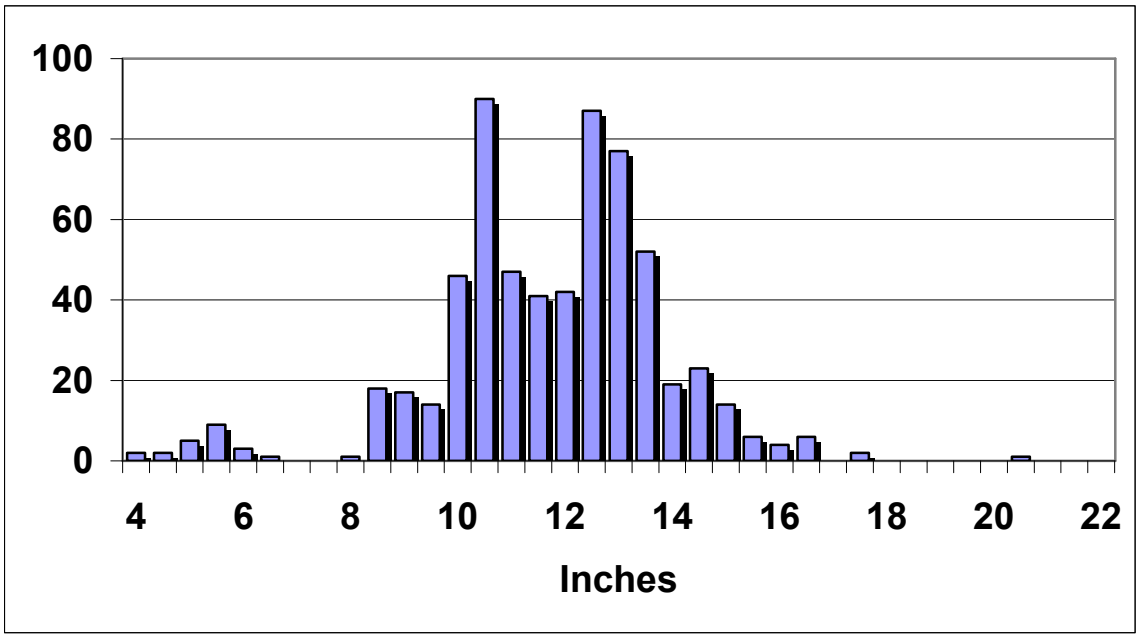

Figure 2. *Size distribution of adult gizzard shad collected during standard fish population surveys at Everett Lake in 2004 (light columns) and 2005 (dark columns).*